He also rendered most important services to submarine telegraphy, acting as chairman of a Committee appointed by the Government to investigate the reasons for the failure of the Atlantic cable of 1858, and the Red Sea and Indian cable; the report of this Committee, issued in 1861, is recognised as the "most valuable collection of facts, warnings and evidence ever compiled concerning submarine cables."

In 1860 he was appointed Assistant-Inspector-General of Fortifications, and two years later he became Assistant-Under-Secretary of State for War. After his retirement from this post he became Director of Works and Public Buildings in Her Majesty's Office of Works, an appointment which he held until 1875.

He was for twenty-five years General Secretary of the British Association, and this fact alone should win for him the gratitude of scientific men; and he only resigned that post to be appointed President in 1895. But sanitary matters especially attracted his attention. As Captain Galton he invented the grate which still goes by his name, and which introduced a new idea. He never patented this invention, so it was to no one's interest to push it; had it not been for this state of things, there is no doubt that it would long ago have come into general use, and would probably have brought a large fortune to its inventor.

He was connected with all the great sanitary undertakings of the last forty years or more. Whether it was the main drainage of the metropolis, or the improvement of the health of the army, or the training of sanitary inspectors, Sir Douglas Galton was always to the fore; in fact, no scheme connected with sanitary improvement has for many years past been considered complete without his co-operation. He strongly opposed the scheme of the Metropolitan Board of Works by which the sewage of London was discharged into the river at Barking and Crossness, urging that a nuisance would be created by it, and that it should be taken down as far as Sea Reach in order to be diluted with a much larger volume of water. The result amply justified his anticipations, and showed the correctness of his judgment.

He was one of the early supporters of the Parkes Museum, and also the leading spirit of the Sanitary Institute, of the Council of which he was chairman for the second time at his death; but to enumerate the positions he filled, and filled with distinction, would take up too much space.

He was elected an Honorary Member of the Institution of Civil Engineers in 1850, and a Fellow of the Royal Society in 1859, and received the honorary degrees of D.C.L. from the University of Oxford, and LL.D. from Durham and from Montreal. He was made a C.B. in 1865, and a K.C.B. in 1887.

Personally he was a kindly and genial man who made many friends, and few, if any, enemies, and his "amiable personality," a phrase happily applied to him by one of the foreign delegates of the International Congress of Hygiene and Demography in 1891, of the executive committee of which he was chairman, will be much missed.

W. H. C.

PROFESSOR OTHNIEL CHARLES MARSH.

JUST within a period of two years the United States has lost two of its most distinguished palæontologists, Cope having passed away on April 12, 1897, while the death of Marsh is announced to have taken place on the 18th of March of the present year. The two names have been associated (not always, unfortunately, in the most amicable manner) in connection with the marvellous discoveries of strange and gigantic creatures which have rendered the last five-and-twenty years unique in the history of palæontology; and it may be regarded as certain that none of their successors, however able they may be, will ever attain the world-wide celebrity accorded to these distinguished workers. For as Owen and Huxley are the two English biologists whose names have become household words, so Marsh and Cope are the popular representatives of Trans-Atlantic palæontological investigation.

Marsh, who was considerably the elder of the two, was the more familiarly known in England, from his custom of making periodical visits to Europe at comparatively short intervals. His last visit was to the Zoological Congress held at Cambridge during the past summer; and all those who then saw him could scarcely fail to notice that the hand of death had already made its grip on the once stalwart frame.

According to the information at present available to us, it appears that Marsh was sixty-eight years of age at the time of his decease. Born in the States, he received a large portion of his education at Yale; but he also studied geology and palæontology at various continental seats of learning, such as Berlin, Breslau, and Heidelberg, thus acquiring a wide basis of knowledge which stood him in good stead in after years. He was appointed to the chair of Palæontology in the University of Yale in the year 1866; and this important post he held till his death. For many years he was also palæontologist in charge to the U.S. Geological Survey, at first under Clarence King and then J. W. Powell; but of his subsequent relations to that department we are not fully aware. Marsh possessed the University degrees of Ph.D., LL.D., and M.A.; and his great attainments were recognised by his affiliation to many European scientific bodies. In this country, he was a Fellow of the Geological Society, having been elected as far back as 1863, and in 1877 having received the first award of the then newly-founded Bigsby Medal. In 1881 he was elected a Corresponding Member of the Zoological Society of London; and he was likewise on the roll of the British Association, whose meetings he on several occasions attended. A nephew, we believe, of the late George Peabody, Marsh was a man of considerable, if not large fortune; and to this circumstance is partly owing the vast extent of the collections he succeeded in accumulating.

Prout's discovery in 1846 in the Miocene strata of Western America of remains belonging to the animals now known as *Titanotherium* was the commencement of the investigations which made celebrated the names of Leidy, Cope, and Marsh. But it was not till 1869 that the older beds on the western flanks of the Rocky Mountains were explored, and the Eocene mammals of America thus brought to light. It was in this year that the explorations in the neighbourhood of Fort Bridger at the base of the Uinta Mountains were commenced; and it was from this district that the Uinta, Bridger, Wasatch, and Wind River beds received their names. The first worker in this field of research was Leidy, whose labours were mainly confined to the fauna of the higher Tertiary beds of the "Mauvaises Terres" to the east of the Rocky Mountains. By 1862, in which year appeared his paper on *Eosaurus* from the Carboniferous of Nova Scotia, Marsh was, however, well to the fore as a working palæontologist, and shortly after the opening-up of the Fort Bridger district as a fossiliferous locality he was almost at the zenith of his fame; the year 1872 being notable as the one in which the now well-known names *Ichthyornis* and *Hesperornis* were applied to the toothed birds of the Kansas Cretaceous. Some idea of the rapidity with which specimens were collected and described may be gathered from the fact that between the years 1862 and 1879 Marsh proposed no less than 134 new generic terms for the fossils he accumulated and described. That many of these names subsequently turned out to be synonyms, in no way detracts from the energetic character of his labours. For it must be remembered that between 1869

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and 1879 he was making known not only the Uintatheres (his so-called Dinocerata) of the Eocene of the Western States, but likewise the huge Jurassic Dinosaurs like *Brontosaurus* and *Atlantosaurus*, as well as the Toothed Cretaceous birds of Kansas. It was during this period, too, that the world was excited by his discovery of the pedigree of the horse, which fortunately came just when an actual example was urgently needed to solidify the foundations of the evolutionary hypothesis.

On this side of the Atlantic we are, perhaps, too apt to regard Marsh in the light of what used to be called a closet naturalist. But he was in reality a courageous and intrepid explorer, who between the years 1869 and 1888 is stated to have crossed the Rocky Mountains no less than twenty-one times. And in the early days of his explorations, before the opening-up of the country by railways, such expeditions contained no slight elements of danger. Not only were there difficulties of the road and inclemencies of climate with which to contend, but hostile Indians were often on his track; and we have heard from the explorer's own lips accounts of some of the perils to which he has been exposed on trips of this description.

We have said that it was between 1869 and 1879 that the great bulk of the early descriptive palæontological work of Marsh took place; and by the latter date he had leisure to undertake more elaborate and detailed memoirs. Accordingly, we find the quarto monograph on "Odontornithes" making its appearance in 1880, and that on "Dinocerata" four years later. We believe that similar monographs on the Titanotheres and Dinosaurs were in contemplation, and the plates for them prepared; but for some reason, into which we need not inquire, these were never issued. A smaller memoir on the last-named group was, however, published in 1896. Whatever may be the final judgment as to the value of the literary matter in the two quarto memoirs, the beauty and exactness of their exquisite illustrations will render them of permanent value.

Twenty years after the discovery of the Bridger and Uinta beds—that is to say, in 1889—Marsh was able to announce the discovery of numerous remains of Cretaceous Mammals in the Laramie formation of Dakota and Montana. And although he was not absolutely the first to make the discovery, the number of specimens he obtained first put the occurrence of mammals in these beds on a firm footing. About this time he was also engaged in making known the gigantic Horned Dinosaurs of the Laramie, whose huge bulk and uncouth forms made them even more marvellous than their predecessors of the Jurassic.

And here it may be mentioned that Marsh by no means confined his investigations to palæontology, frequently entering upon questions of the age of strata. A remarkable instance of this is a paper urging that the British Wealden strata should be regarded as of Upper Jurassic rather than of Lower Cretaceous age; a communication which, we think, has scarcely received all the attention that it deserves at the hands of European workers.

What will be the final verdict in regard to Marsh's life-work, it is too early to attempt to forecast. As a collector and explorer he had great and unrivalled opportunities; and in this part of his task, at least, he rose fully to the occasion. He saw his opportunity of making a great name, and he took it. And yet, perhaps, this is scarcely a fair way of putting it, for there is little doubt that Marsh had a strong and innate love for his work, which would have led him to be a palæontologist under any circumstances.

Being a man of great determination and strength of will, he, like many others of the same turn of mind, could ill brook contradiction; and he was accordingly somewhat too apt to insist on his own views and hypotheses long after they had been proved incorrect or untenable. And it was probably this impatience of contradiction and correction that at times led him to mistake reiterated and dogmatic assertion of refuted statements for logical argument. That Marsh is entitled to claim a place in the very front rank of scientific workers is not likely to be urged; and there are, in truth, no grand and enduring generalisations associated with his name. At the same time, to paraphrase the words of the donors of the Bigsby and Lyell medals, he is undoubtedly one who has been of the most eminent service to palæontology, and has, therefore, deserved well of the science.

Allusion has already been made incidentally to certain acrimonious feelings connected with his work on the other side of the Atlantic. May we venture to hope that in the future his co-labourers and successors in America will endeavour to dwell on his merits rather than on his failings, and to remember that the time-honoured motto, "*De mortuis nil nisi bonum*," has not yet been superseded. R. L.

WIRELESS TELEGRAPHY BETWEEN FRANCE AND ENGLAND.

MR. MARCONI is to be cordially congratulated upon the success which has attended his latest experiments in telegraphy without intervening wires. For several months he has been actively engaged in establishing communication by means of his apparatus between stations several miles apart. He has gradually increased the distance between the stations, and has now succeeded in exchanging messages across the Channel. The *Times* of yesterday prints the following message transmitted by wireless telegraphy from France, and the communication possesses particular interest on account of the fact that it is the first press message sent across the Channel by the wireless telegraph system.

"*Wimreux*, March 28.

"Communication between England and the Continent was set up yesterday morning by the Marconi system of wireless telegraphy. The points between which the experiments are being conducted are South Foreland and Wimreux, a village on the French coast, two miles north of Boulogne, where a vertical standard wire, 150 feet high, has been set up. The distance is thirty-two miles. The experiments are being carried on in the Morse code. Signor Marconi is here conducting the trials, and is very well satisfied with the results obtained.

"This message has been transmitted by the Marconi system from Wimreux to the Foreland."

The Dover correspondent of the *Times* states that this and other messages were received and read at the South Foreland station with as much distinctness as though the termini had been connected with wires. This is a very remarkable achievement, and one that will to some extent compensate Mr. Marconi for the trouble he has taken to bring his apparatus to that state of perfection which has led to such gratifying success. The practical value of a system of telegraphy which enables messages to be exchanged across the Channel without the use of connecting wires cannot be over-estimated.

The experiments were conducted by Mr. Marconi in the presence of Colonel du Pontavice, French military attaché, and Commandant Fiéron, naval attaché in London; Captain Ferrier, representing the French Government, and M. Voisenat, of the French telegraph service. The results obtained have placed the efficiency of Mr. Marconi's instruments beyond doubt, and we may hope soon to see the establishment of a regular system of communication with the continent by means of telegraphy without connecting wires.

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